

# KOLON's R&D on the Substrates for Flexible Electronics

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Flexible electronics have attracted people's huge interest, mainly due to their unique features such as lightness, thinness, and design freedom. In addition, they can be manufactured through R2R process, which can bring dramatic manufacturing cost-down.<sup>1</sup> Flexible displays have been known to be one of the most promising flexible electronics. Samsung has launched "Galaxy Edge" using a conventional polyimide as a bottom substrate. Even though it is a bent display, it implies that the real flexible display era would open in near future.<sup>2</sup>

There are two main components required for achieving flexible displays. They are flexible substrate (bottom and cover window) and flexible TFT. As a material company, KOLON has been concentrating on R&D of the flexible polymeric substrate.

We have developed "colorless polyimides (CPI)", which have no color and high thermal stability unlike conventional polyimides.<sup>3</sup> They can be used as not only a bottom substrate for flexible transparent display but also a cover window. The first target application of our CPI film is the cover window, which means the replacement of reinforced glass. The characteristic properties of the hard coated CPI film are summarized in the Table 1.

We have been also developing CPI solution as a bottom substrate for transparent displays. Its properties are described in Table 2. They imply that our CPI solution is applicable to TFT which process temperature is around 350°C.

**Table 1.** Thermal and optical properties of the hard coated CPI film

Property	Value	Remark
Transmittance(%)	>90	UV-VIS (@550 nm)
Yellow Index	<2.0	UV-VIS (ASTM E313)
Surface Hardness(H)	9	Pensile Method
Bending Radius	<3R	200K Bending TEST

**Table 2.** Thermal and optical properties of the CPI Solution

Property	Value	Remark
Viscosity(Ps)	<100	Solid Content <15wt%
Transmittance(%)	>89	UV-VIS (@550 nm, 10um thickness film)
Tg.(°C)	>300	DSC
Td <sub>1wt%</sub> (°C)	>440	TGA
CTE(ppm/°C)	<30	TMA (@50~300°C)
Retardation(nm)	<300nm	Prism Coupler (10um thickness film)

## References

1. *Technology Trend in Flexible Displays*, Weekly Trend, ICT Report, IIPT (2014.9)
2. *Flexible Display Technology & Market Report*, IHS (2014)
3. Hak-Gee Jung, Polyimide Film, US Patent No. 7,968,670 (2011)